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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,990	10/29/2003	Howard E. Rhodes	M4065.0732/P732	5298
24998	7590	03/21/2005	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			TRAN, MAI HUONG C	
2101 L Street, NW			ART UNIT	
Washington, DC 20037			PAPER NUMBER	
			2818	

DATE MAILED: 03/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 10/694,990	Applicant(s) RHODES, HOWARD E.	
	Examiner Mai-Huong Tran	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-136 is/are pending in the application.
- 4a) Of the above claim(s) 62-133 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-61, 135 and 136 is/are allowed.
- 6) ☒ Claim(s) 1-11, 14-21 and 134 is/are rejected.
- 7) ☒ Claim(s) 12 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restriction

Application's election without traverse of Group I (Claims 1-61 and 134-136) drawn to a semiconductor device is acknowledged for prosecution in the subject application. Accordingly, claims 62-133 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Applicants have the right to file a divisional application covering the subject matter of the non-elected claims.

Drawings

The drawings are objected to for the following reasons.

Figures 1-4B are not designated by a legend such as "Prior Art". The Legend is necessary in order to clarify what applicant's invention is (see MPEP § 608.02g).

Reference sign 32' is not included in the drawings (e.g. fig. 5A) (see 37 CFR § 1.84p). Correction is required.

Applicant is required to submit a proposed drawing correction, showing changes in red ink, in response to this Office action. However, formal correction of the noted defect(s) can be deferred until the application is allowed by the examiner (see MPEP § 608.02v).

Claim Objections

Claim 36 is objected to because of the following reasons.

In claim 36, 'said implant dose...' is unclear since the independent claim 22 has a first impurity implant dose and a second impurity dose implant. So, the implant dose in claim 36 refers to the first or second impurity implant dose?

Claim Rejections - 35 U.S.C. § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6 and 134 are rejected under 35 U. S. C. § 102 (e) as being anticipated by U.S. Patent No. 6,794,698 to Perng et al..

Regarding to claims 1 and 134, Perng discloses a semiconductor device comprising at least one isolation trench 4 provided in a substrate 30 having a first conductivity type, the substrate having a first dopant concentration; and a doped region 12 having first conductivity type surrounding at least a portion of the trench 4 in the

Art Unit: 2818

substrate, the doped region 12 having a second dopant concentration (col. 7, lines 20-25, col. 7, lines 33-48, col. 9, lines 12-17).

Regarding to claim 2, Perng discloses a semiconductor device wherein the trench comprises a dielectric material (col. 7, lines 49-58).

Regarding to claim 3, a semiconductor device wherein the dielectric material is selected from at least one of SiO, SiO.sub.2, oxynitride, silicon nitride, and silicon carbide (col. 15, claim 5).

Regarding to claim 4, a semiconductor device wherein the trench is a shallow trench isolation region (col. 1, lines 65-67).

Regarding to claim 5, a semiconductor device wherein the dielectric material is a high density plasma oxide (col. 15, claim 5).

Regarding to claim 6, a semiconductor device wherein first conductivity is a p-type conductivity (col. 7, lines 20-22).

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-8 and 14-15 are rejected under 35 U.S.C. 103 (a) as being unpatentable over US Patent No. 6,794,698 to Perng et al. in view of the remark.

Regarding to claim 7, Perng discloses the surface dopant concentration of the doped region is at least about 5×10^{17} arsenic atoms/cm³ (col. 9, lines 17-19) except for a semiconductor device wherein the doped region has an implant dose of from approximately 3.0×10^{11} atoms/cm² to approximately 3.0×10^{13} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the doped region has an implant dose of from approximately 3.0×10^{11} atoms/cm² to approximately 3.0×10^{13} atoms/cm². since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 8, Perng discloses the surface dopant concentration of the doped region is at least about 5×10^{17} arsenic atoms/cm³ (col. 9, lines 17-19) except for a semiconductor device wherein the doped region has an implant dose of from approximately 5.0×10^{11} atoms/cm² to approximately 6.0×10^{12} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the doped region has an implant dose of from approximately 5.0×10^{11} atoms/cm² to approximately 6.0×10^{12} atoms/cm². since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 14, Perng discloses the claimed invention except for a semiconductor device wherein the substrate has a p-type implant concentration of from about 1.0×10^{14} atoms/cm³ to about 1.0×10^{16} atoms/cm³.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the substrate has a p-type implant concentration of from about 1.0×10^{14} atoms/cm³ to about 1.0×10^{16} atoms/cm³. since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 15, Perng discloses the claimed invention except for a semiconductor device wherein the substrate has a p-type implant concentration of from about 5.0×10^{14} atoms/cm³ to about 3.0×10^{15} atoms/cm³.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the substrate has a p-type implant concentration of from about 5.0×10^{14} atoms/cm³ to about 3.0×10^{15} atoms/cm³. since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Claims 9-11 and 16-21 are rejected under 35 U.S.C. 103 (a) as being unpatentable over US Patent No. 6,794,698 to Perng et al. in view of Kopley et al. (US 6,417,074). and further in view of the remark.

Regarding to claim 9, Perng discloses the claimed invention except for the semiconductor device wherein the photosensor is a photodiode formed adjacent to the doped region and trench, the photodiode having a p-type region and an n-type region. However, Kopley teaches the semiconductor device wherein the photosensor is a photodiode formed adjacent to the doped region and trench, the photodiode having a p-type region and an n-type region (col. 2, lines 19-32, and fig. 5).

Regarding to claim 10, Pergn in view of Kopley discloses the claimed invention except for the semiconductor device wherein the p-type region has an implant dose of from approximately 3.0×10^{12} atoms/cm² to approximately 1.0×10^{14} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the p-type region has an implant dose of from approximately 3.0×10^{12} atoms/cm² to approximately 1.0×10^{14} atoms/cm². since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 11, Pergn in view of Kopley discloses the claimed invention except for the semiconductor device wherein the p-type region has an implant dose of from approximately 5.0×10^{12} atoms/cm² to approximately 4.0×10^{13} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the p-type region has an implant dose of from approximately 5.0×10^{12} atoms/cm² to approximately 4.0×10^{13} atoms/cm². since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 16, Pergn in view of Kopley discloses the claimed invention except for the semiconductor device further comprising a p-well region located beneath the trench and doped region, the p-well region having an implant dose of from about 5.0×10^{11} atoms/cm² to about 5.0×10^{13} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device further comprising a p-well region located beneath the trench and doped region, the p-well region having an implant dose of from about 5.0×10^{11} atoms/cm² to about 5.0×10^{13} atoms/cm². since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claim 17, Pergn in view of Kopley discloses the claimed invention except for the semiconductor device wherein the p-well region has an implant dose of from about 1.0×10^{12} atoms/cm² to approximately 1.0×10^{13} atoms/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a semiconductor device wherein the p-well region has an implant dose of from about 1.0×10^{12} atoms/cm² to approximately

1.0.times.10.sup.13 atoms/cm.sup.2. since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding to claims 18-19, Kopley discloses a semiconductor device wherein the image device is a CCD imager or a CMOS imager (col. 1, lines 20-23).

Regarding to claim 20, Kopley discloses a semiconductor device wherein the photosensor is one of a photoconductor or photogate (col. 2, lines 49-67, col. 3, lines 1-8).

Regarding to claim 21, Kopley discloses a semiconductor device wherein the photodiode is a pnp photodiode (cols. 1-2).

Allowable Subject Matter

Claims 12-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 22-61, 135 and 136 are allowed.

Conclusion

Any inquiry concerning this communication on earlier communications from the examiner should be directed to Mai-Huong Tran, (571) 272-1796. The examiner can normally be reached on Monday-Thursday from 8:00 AM to 6:30 PM. The examiner's supervisor, David Nelms can be reached on (571) 272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Mai-Huong Tran

